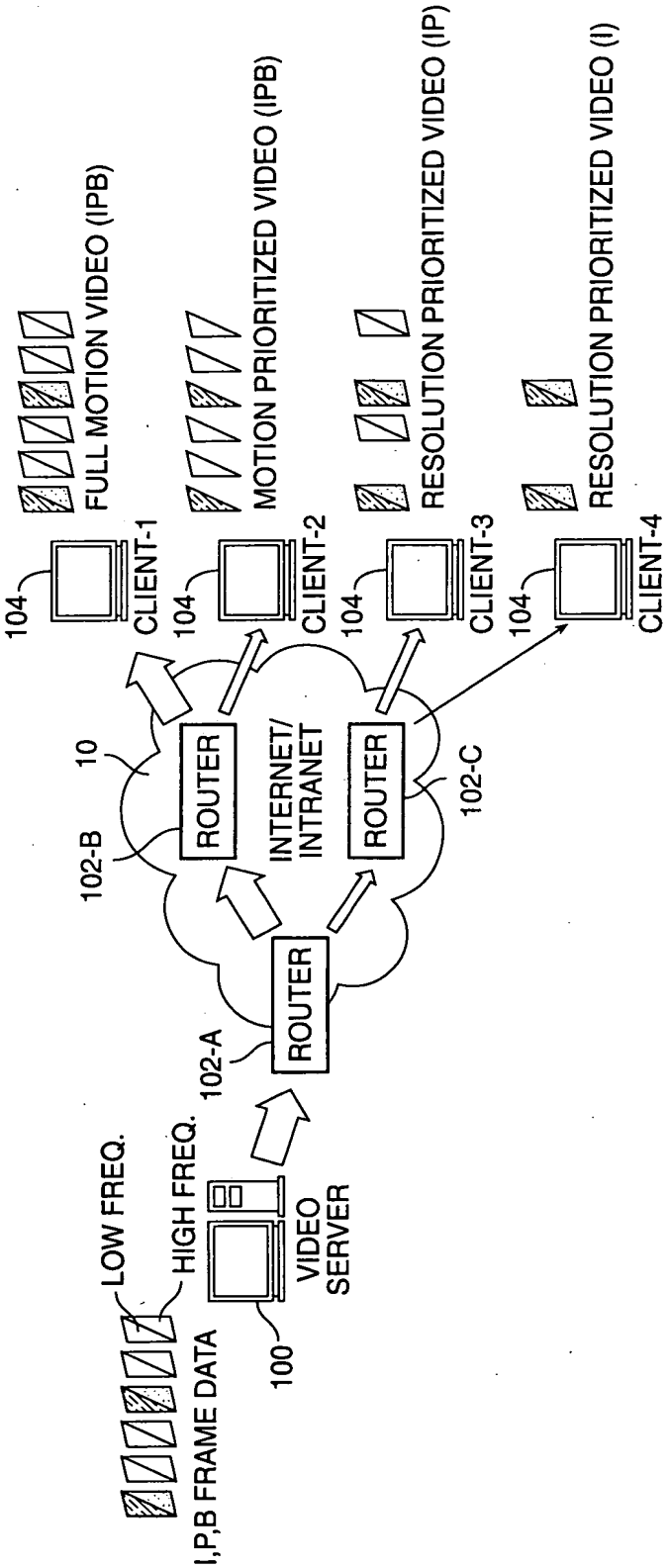
I,P,B FRAME DATA
LOW FREQ.
HIGH FREQ.
100
VIDEO SERVER
102-A
ROUTER
INTERNET/ INTRANET
10
102-B
ROUTER
ROUTER
102-C
104
CLIENT-1
FULL MOTION VIDEO (IPB)
104
CLIENT-2
MOTION PRIORITIZED VIDEO (IPB)
104
CLIENT-3
RESOLUTION PRIORITIZED VIDEO (IP)
104
CLIENT-4
RESOLUTION PRIORITIZED VIDEO (I)

FIG. 1

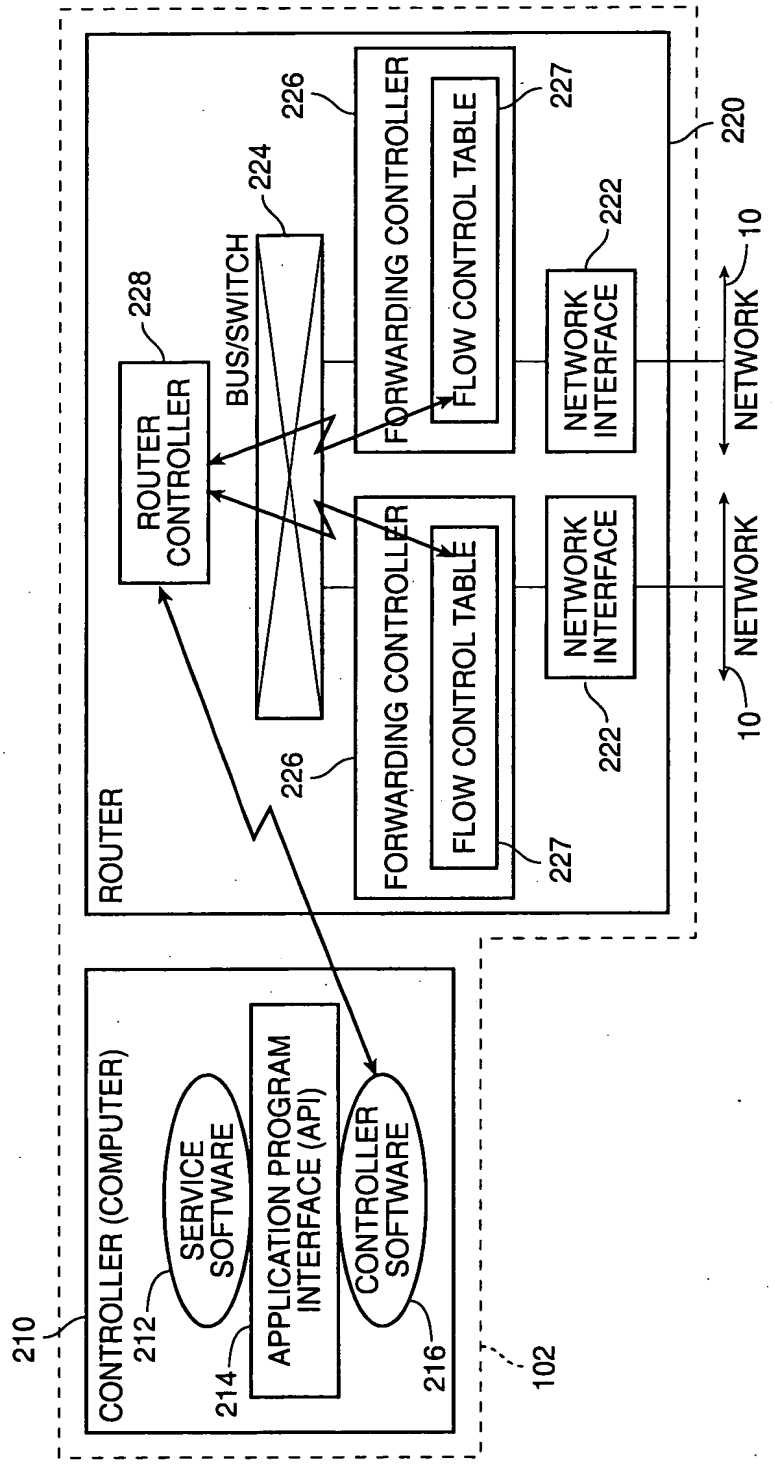
210
CONTROLLER (COMPUTER)
212
SERVICE SOFTWARE
214
APPLICATION PROGRAM INTERFACE (API)
216
CONTROLLER SOFTWARE
102
ROUTER
228
ROUTER CONTROLLER
BUS/SWITCH
224
226
FORWARDING CONTROLLER
227
FLOW CONTROL TABLE
222
NETWORK INTERFACE
220
10
NETWORK

FIG. 2

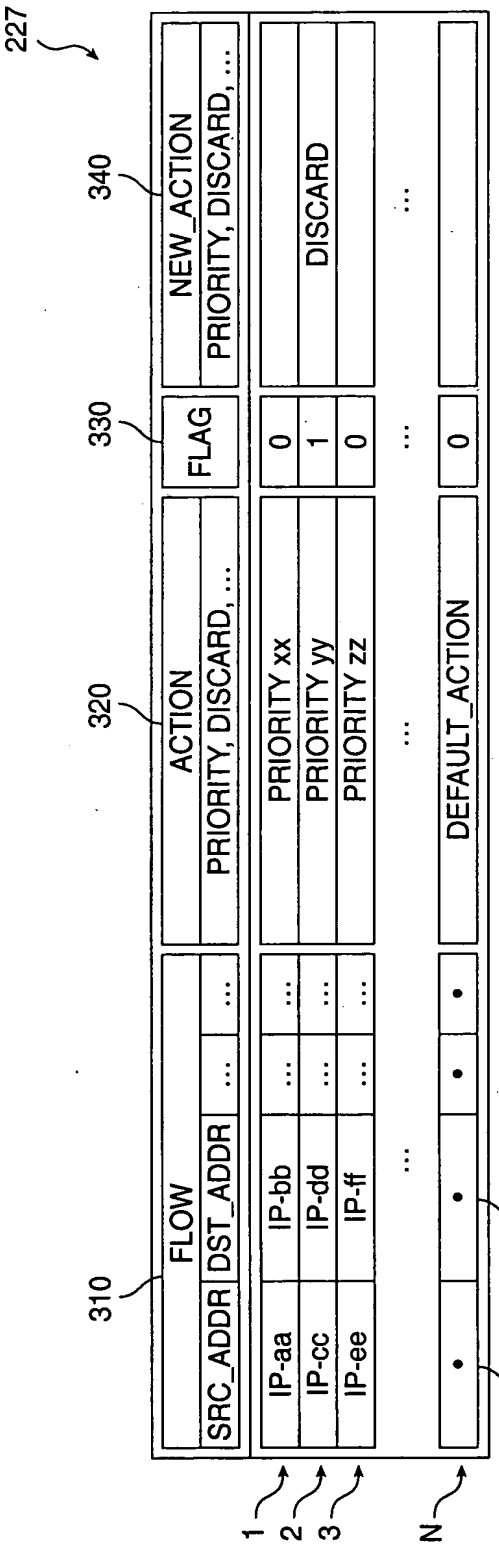
227
310
320
330
340
FLOW
SRC_ADDR
DST_ADDR
...
...
ACTION
PRIORITY, DISCARD, ...
FLAG
NEW_ACTION
PRIORITY, DISCARD, ...
IP-aa
IP-bb
...
...
PRIORITY xx
0
DISCARD
IP-cc
IP-dd
...
...
PRIORITY yy
1
IP-ee
IP-ff
...
...
PRIORITY zz
0
...
...
...
DEFAULT_ACTION
0
312
314
1
2
3
N

FIG. 3

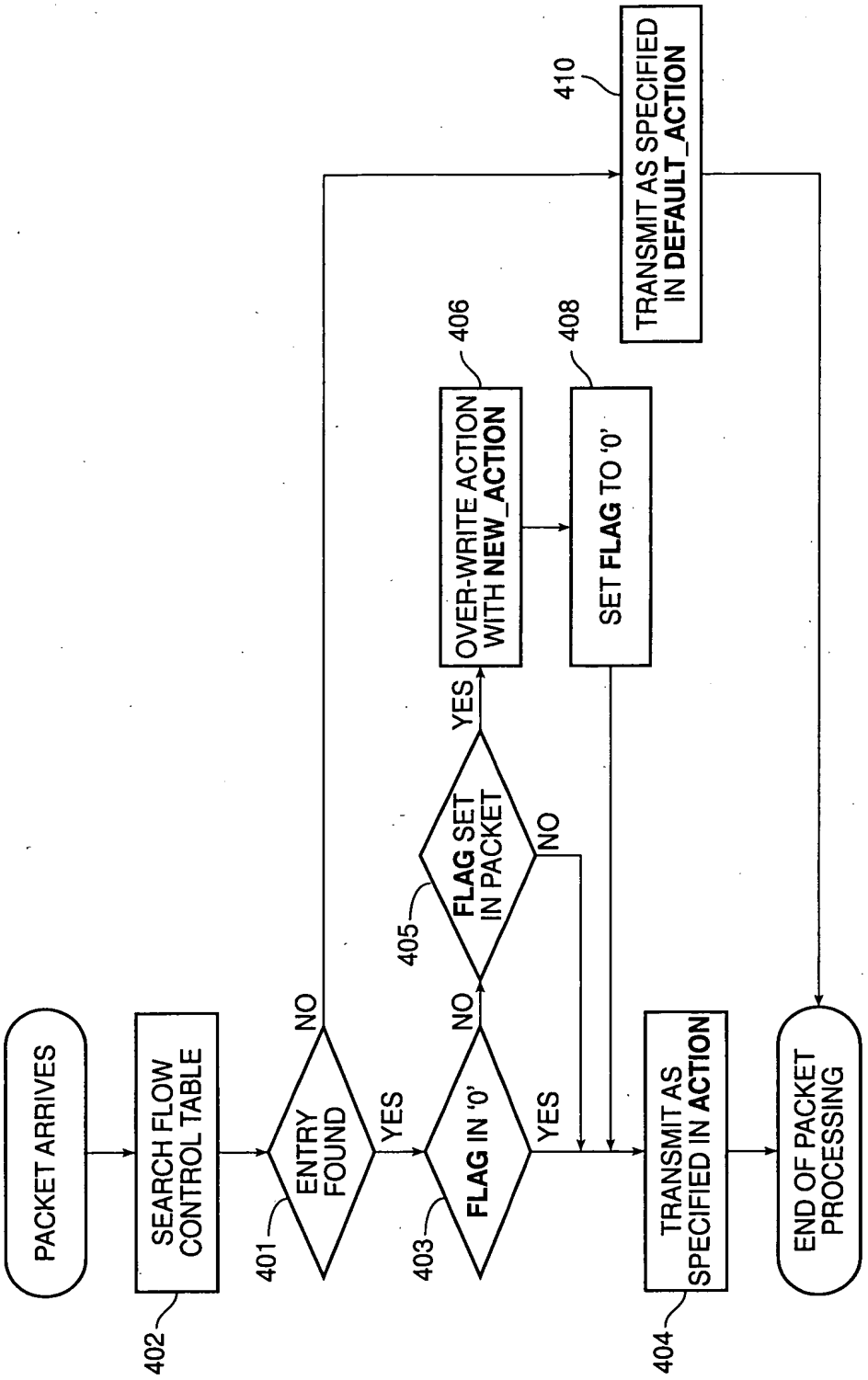
PACKET ARRIVES
SEARCH FLOW CONTROL TABLE
402
ENTRY FOUND
401
NO
YES
FLAG IN '0'
403
NO
YES
FLAG SET IN PACKET
405
NO
YES
OVER-WRITE ACTION WITH NEW_ACTION
406
SET FLAG TO '0'
408
TRANSMIT AS SPECIFIED IN DEFAULT_ACTION
410
TRANSMIT AS SPECIFIED IN ACTION
404
END OF PACKET PROCESSING

FIG. 4

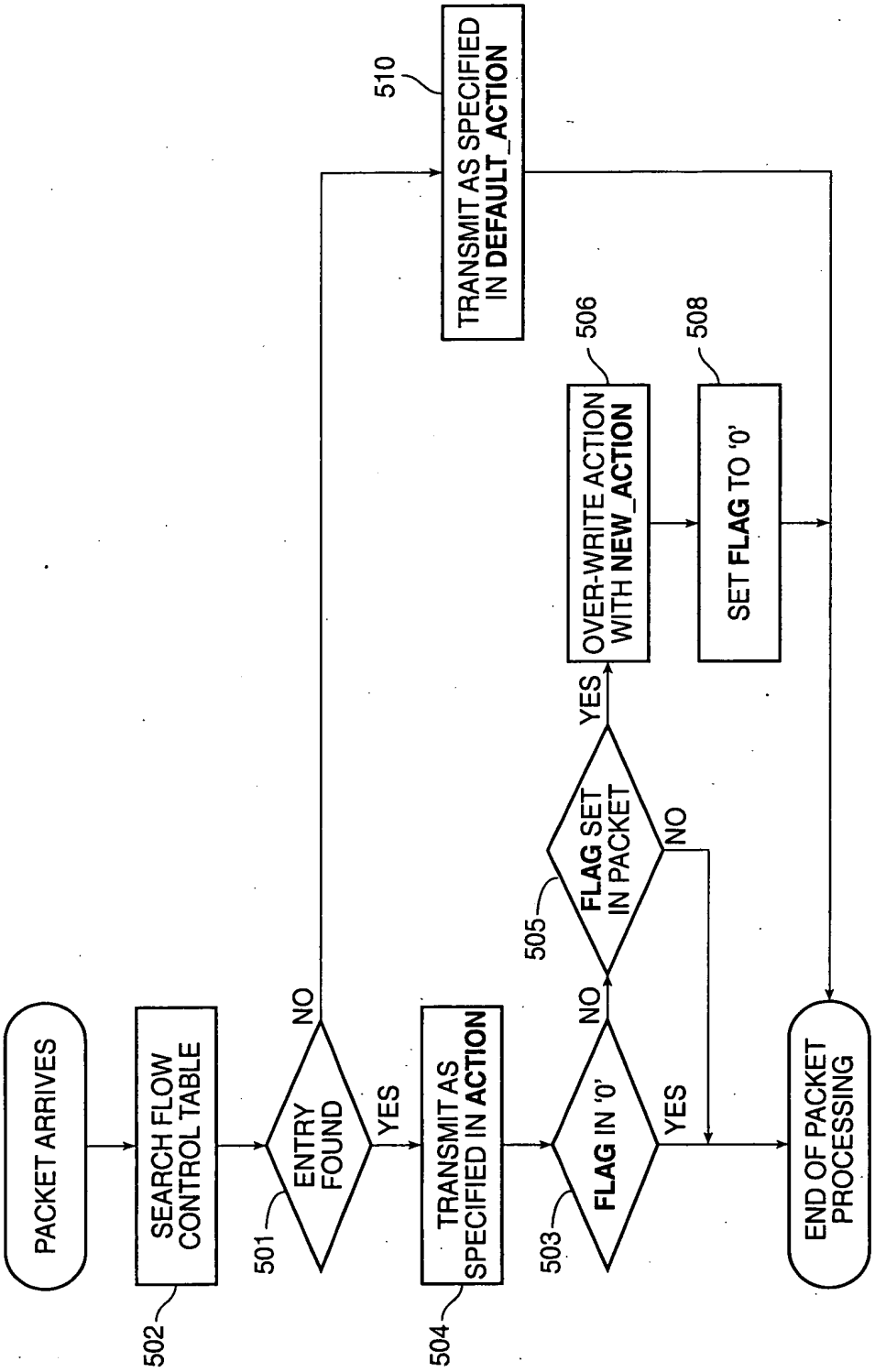
PACKET ARRIVES
SEARCH FLOW CONTROL TABLE
502
ENTRY FOUND
501
NO
YES
TRANSMIT AS SPECIFIED IN ACTION
504
FLAG IN '0'
503
NO
YES
FLAG SET IN PACKET
505
NO
YES
OVER-WRITE ACTION WITH NEW_ACTION
506
SET FLAG TO '0'
508
TRANSMIT AS SPECIFIED IN DEFAULT_ACTION
510
END OF PACKET PROCESSING

FIG. 5

```
struct END_POINT {
        IP_ADDRESS          ipaddr ;        /* may be range of addresses  */
        unsigned short      port ;          /* may be range of ports      */
         ...
} ;

struct FLOW {
        END_POINT           source ;
        END_POINT           destination ;
         ...
        octet               protocol_id ;
         ...
} ;

struct ACTION {
         ...
        /* Specify priority, mode (DISCARD), etc), etc.                    */
        /* Could be a list, relating values of particular packet field to an ACTION  */
         ...
} ;

enum FLAG { CHANGE_IMMEDIATE, CHANGE_SYNCHRONOUS } ;

boolean Set_QoS ( in FLOW target_flow, in ACTION new_action, in FLAG flag ) ;
```

FIG. 6

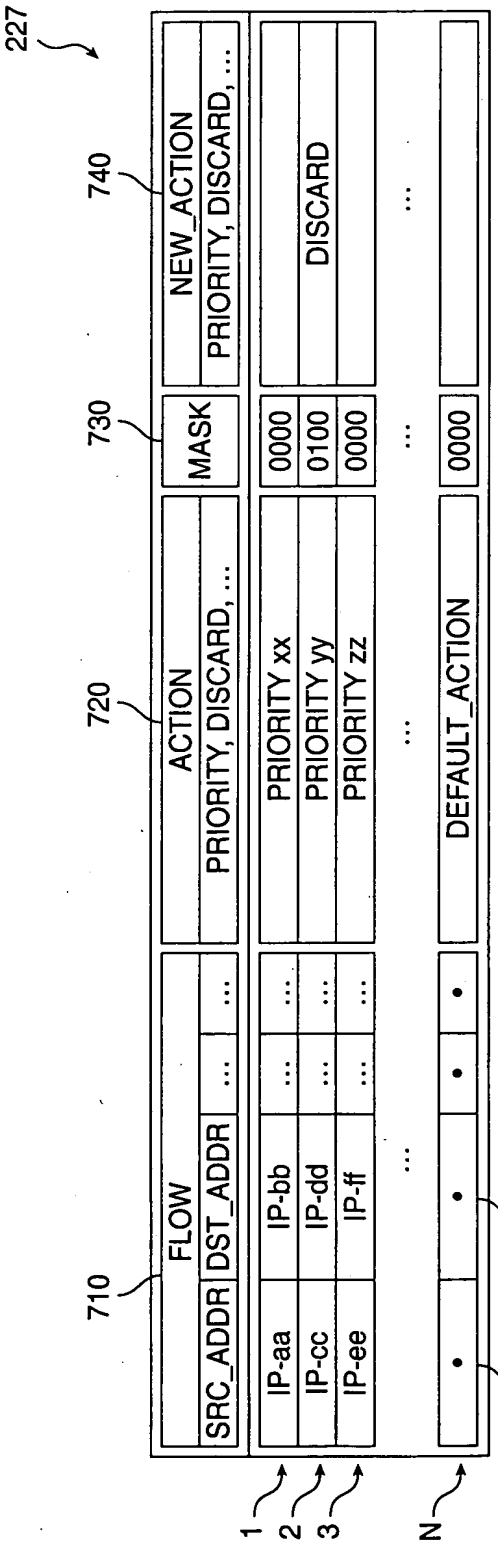
227
710
720
730
740
FLOW
SRC_ADDR
DST_ADDR
ACTION
PRIORITY, DISCARD, ...
MASK
NEW_ACTION
PRIORITY, DISCARD, ...
IP-aa
IP-bb
IP-cc
IP-dd
IP-ee
IP-ff
PRIORITY xx
PRIORITY yy
PRIORITY zz
0000
0100
0000
DISCARD
DEFAULT_ACTION
0000
712
714
1
2
3
N

FIG. 7

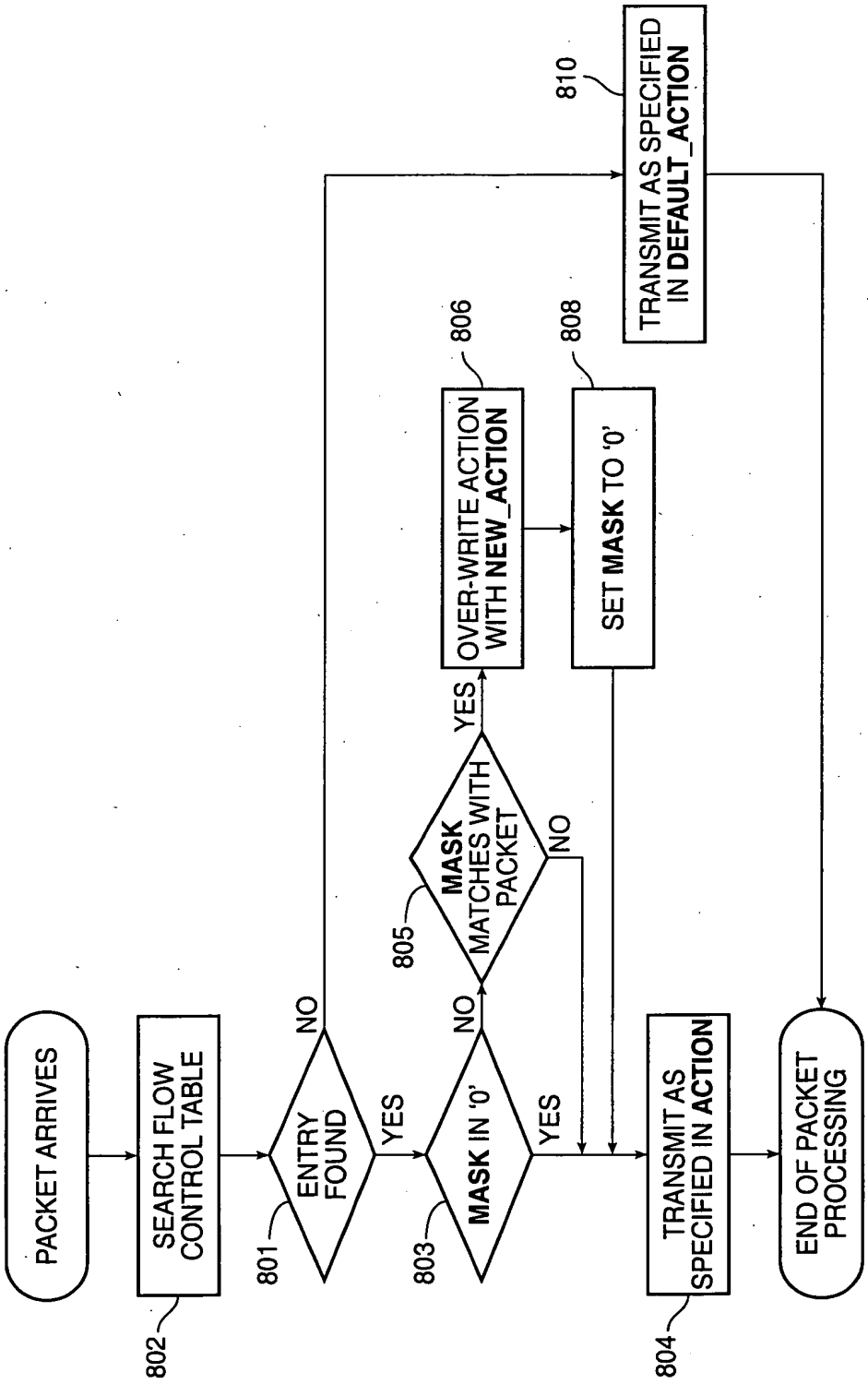
PACKET ARRIVES
SEARCH FLOW CONTROL TABLE
802
ENTRY FOUND
801
NO
YES
MASK IN '0'
803
NO
YES
MASK MATCHES WITH PACKET
805
YES
NO
OVER-WRITE ACTION WITH NEW_ACTION
806
SET MASK TO '0'
808
TRANSMIT AS SPECIFIED IN DEFAULT_ACTION
810
TRANSMIT AS SPECIFIED IN ACTION
804
END OF PACKET PROCESSING

FIG. 8

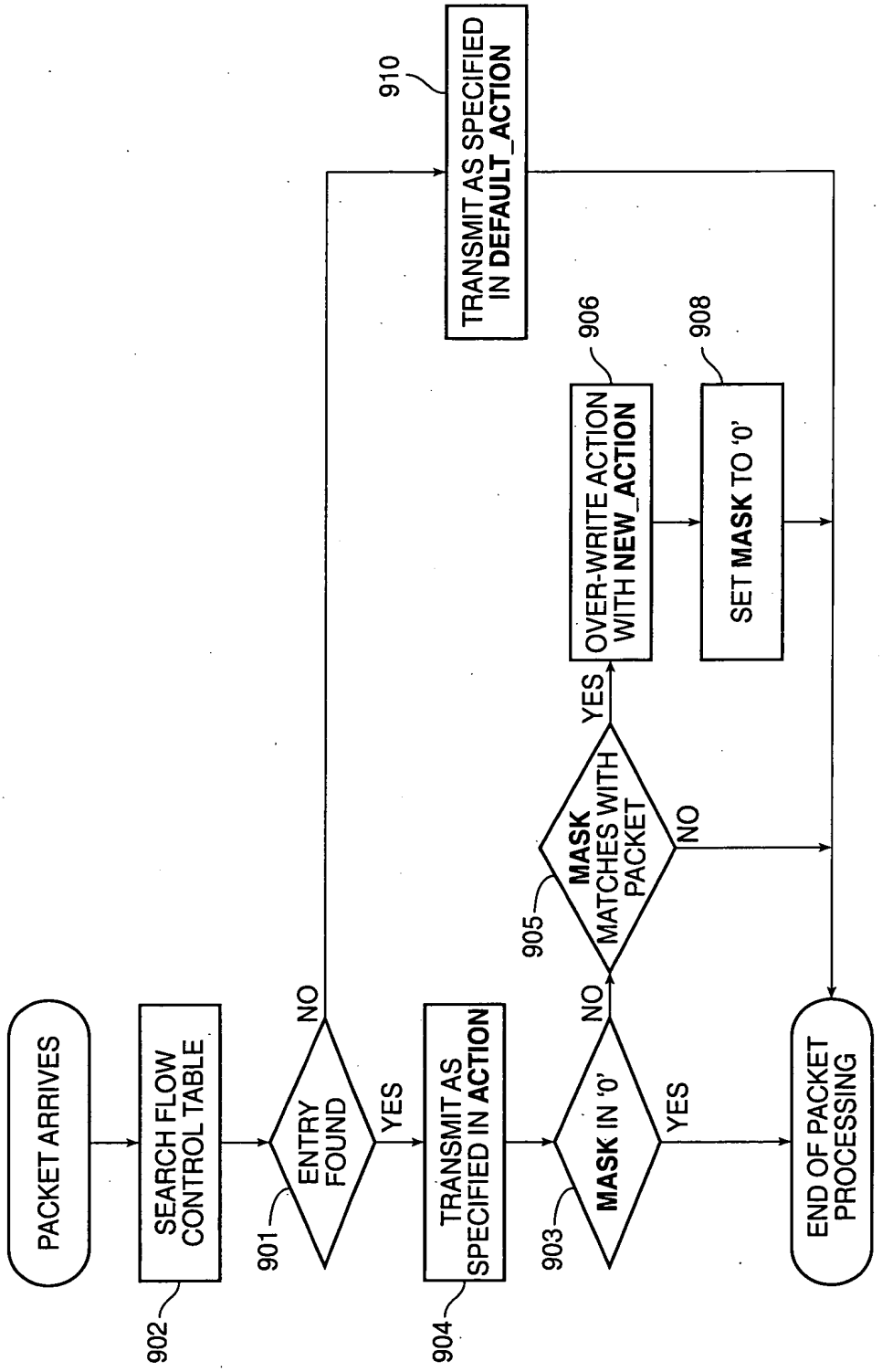
PACKET ARRIVES
SEARCH FLOW CONTROL TABLE
902
ENTRY FOUND
901
NO
YES
TRANSMIT AS SPECIFIED IN ACTION
904
MASK IN '0'
903
NO
YES
MASK MATCHES WITH PACKET
905
NO
YES
OVER-WRITE ACTION WITH NEW_ACTION
906
SET MASK TO '0'
908
TRANSMIT AS SPECIFIED IN DEFAULT_ACTION
910
END OF PACKET PROCESSING

FIG. 9

```
boolean Set_QoS ( in FLOW target_flow, in ACTION new_action, in octet mask ) ;
```

FIG. 10

```
enum HEADER_FIELD { TOS_FIELD, ... } ;

typedef sequence<octet>        FIELD_VALUE ;

struct PAYLOAD_FIELD {
        unsigned short         offset_position ;
        unsigned short         field_field ;
} ;

enum MASK_POSITION { IN_HEADER, IN_PAYLOAD } ;

union MASK switch (MASK_POSITION) {
    case IN_HEADER:
        HEADER_FIELD           target_header_field ;
        FIELD_VALUE            field_value ;
    case IN_PAYLOAD ;
        PAYLOAD_FIELD          target_payload_field ;
        FIELD_VALUE            field_value ;
} ;

boolean Set_QoS ( in FLOW target_flow, in ACTION new_action, in MASK mask ) ;
```

FIG. 11

```
boolean Set_QoS ( in FLOW target_flow, in ACTION new_action ) ;

boolean Commit_Change ( in MASK mask ) ;
```

FIG. 12

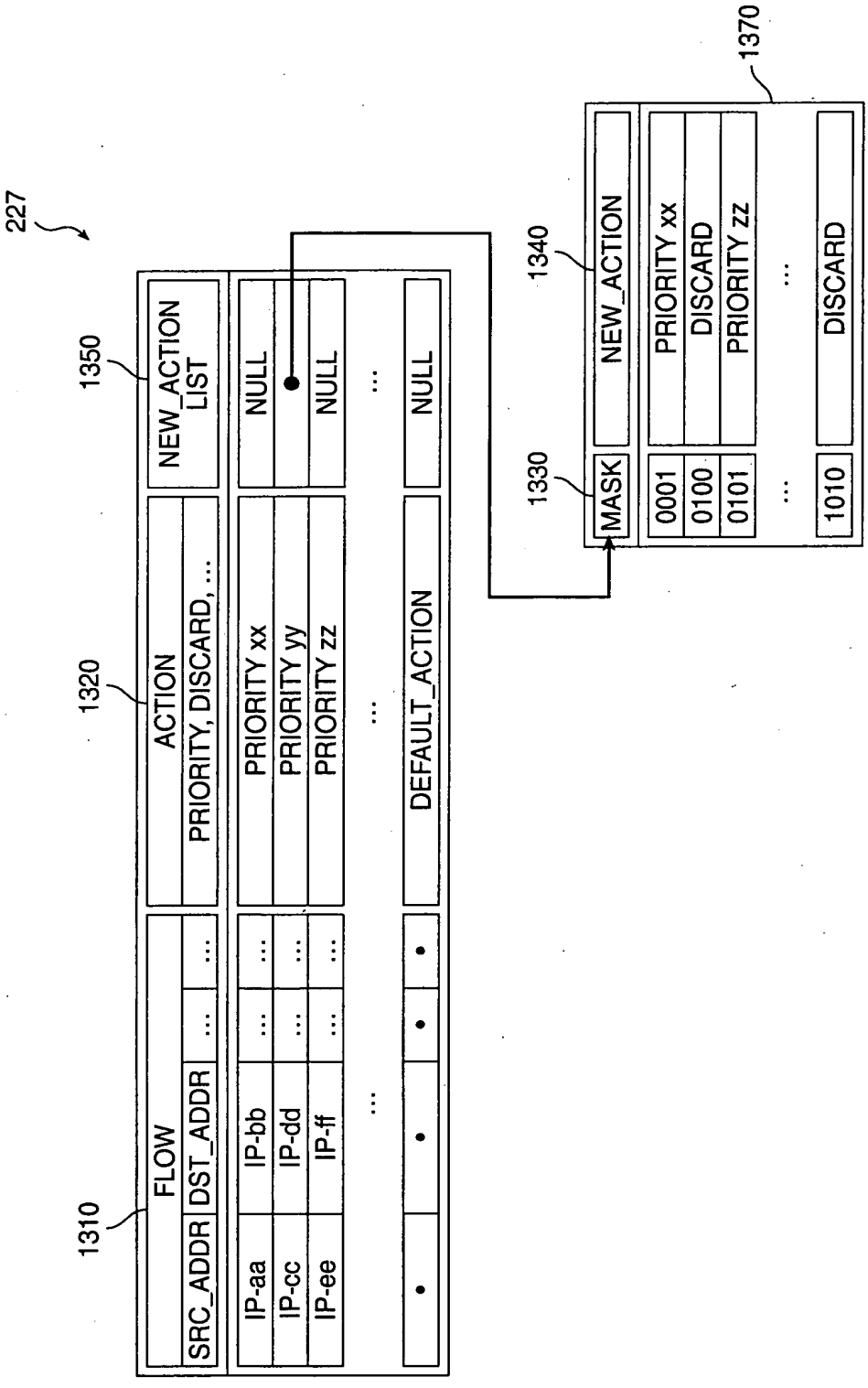
227
1310
FLOW
SRC_ADDR
DST_ADDR
IP-aa
IP-cc
IP-ee
IP-bb
IP-dd
IP-ff
1320
ACTION
PRIORITY, DISCARD, ...
PRIORITY xx
PRIORITY yy
PRIORITY zz
DEFAULT_ACTION
1350
NEW_ACTION LIST
NULL
NULL
NULL
1330
MASK
0001
0100
0101
1010
1340
NEW_ACTION
1370
PRIORITY xx
DISCARD
PRIORITY zz
DISCARD

FIG. 13

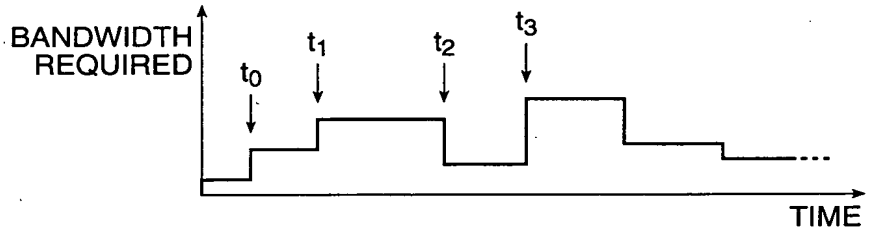
BANDWIDTH REQUIRED
t0
t1
t2
t3
TIME

FIG. 14

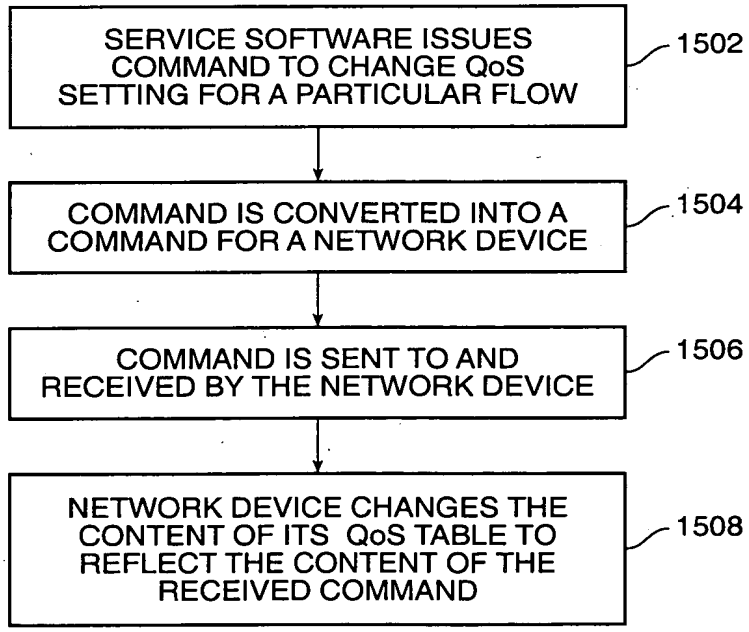
SERVICE SOFTWARE ISSUES COMMAND TO CHANGE QoS SETTING FOR A PARTICULAR FLOW
1502
COMMAND IS CONVERTED INTO A COMMAND FOR A NETWORK DEVICE
1504
COMMAND IS SENT TO AND RECEIVED BY THE NETWORK DEVICE
1506
NETWORK DEVICE CHANGES THE CONTENT OF ITS QoS TABLE TO REFLECT THE CONTENT OF THE RECEIVED COMMAND
1508

FIG. 15